

In-flight sensor tests a step toward Structural Health Monitoring for safer flights

Sandia testing advanced technology to enhance aviation safety

By Heather Clark

Nine commercial aircraft flying regular routes are on the frontier of aviation safety, carrying sensors that monitor their structural health along with their routine maintenance. These flight tests are part of a Federal Aviation Administration (FAA) certification process that will make the sensors widely available to US airlines.

"The flight test program is underway," says Dennis Roach, a senior scientist in Sandia's Transportation, Safeguards & Surety Program 6620 who has worked in aviation safety for 25 years. "We have moved past laboratory research and are looking for certification for actual on-board usage. Our activities are proving that the sensors work on particular applications and that it is safe and reliable to use these sensor systems for routine aircraft maintenance."

Flight tests complement lab tests

Delta Air Lines Inc. and a non-US aircraft manufacturer have partnered with Sandia researchers in two separate programs to install about 100 sensors on commercial aircraft. These teams worked together to provide the installation procedures for technicians and now oversee monitoring of the in-flight tests.

The flight tests complement laboratory performance testing at Sandia to provide the critical step in a decade-long journey to enhance airline safety through a more comprehensive program of Structural Health Monitoring. SHM uses nondestructive inspection principles — technologies that examine materials for damage without affecting their usefulness — and built-in sensors that automatically and remotely assess an aircraft's structural condition in real-time and signal the need for maintenance.

Dennis says the goal of monitoring the sensors installed on the aircraft is to accu-

"We have moved past laboratory research and are looking for certification for actual on-board usage."

— Sandia researcher
Dennis Roach



SENIOR SCIENTIST Dennis Roach (6620), center, works inside the cabin of a B737 test bed installing and acquiring data from Structural Health Monitoring sensors with mechanical engineers Stephen Neidigk, left, and Tom Rice (both 6621). (Photo by Randy Montoya)

mulate successful flight history to show that the sensors can sustain the operating environment, while providing the proper signals for flaw detection.

SHM eventually could help airlines save money by basing maintenance on the actual condition of the aircraft, rather than fixed schedules and inspection routines that might not be necessary, thereby reducing airplanes' downtimes, Dennis says.

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Sandia LabNews

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Our strategic journey

State of the Labs Division presentations
Sandia President and Labs Director Paul Himmert

More information on page 5

Family Day 2014 ready to go this Saturday

After months of planning, Family Day 2014 is ready to go. It takes place Saturday, Sept. 20, 9 a.m.-3 p.m.

Although Hardin Field can be called a hub of the day's activities, things to do and see are spread throughout the Labs' hundreds of buildings and test sites, both on and off of Kirtland Air Force Base.



Important change for Family Day 2014 hosts

The Security Plan for Family Day 2014 has been amended. This requires each host to carry a printed copy of their registration form while at the event. See page 6 for details.

Online registration, which closed on Sept. 12, suggests a crowd of about 10,000. The number of activities, events, and demonstrations are up about 33 percent from Family Day 2009.

Family Day events go back to Sandia's early days. The first was in 1959. The theme for each has been pretty consistent through the years, with the emphasis shifting from time to time.

This year's event directly supports a Corporate Milestone focused on fostering workforce enrichment.

Specifically, the goals of this year's open house are to:

- Encourage talent retention of the workforce,
- Promote health of the workforce,
- Encourage students to succeed in school and pursue science, technology, engineering, and math careers, and
- Provide families an understanding of Sandia's mission, work, and programs.

See pages 6 and 7 for more details and updates about Family Day 2014. Don't forget the five-page special that ran in the Sept. 5 *Lab News*. Also, visit the website — <http://familyday.sandia.gov>.

Consolidating Sandia's explosives operations



SHANE SNEDIGAR (2554) assembles a Sandia Instrumented Thermal Ignition (SITI) cook-off experiment inside Lab 1215's 1kg walk-in high explosive chamber. These laboratory-scale experiments provide data necessary for prediction of weapon system response to abnormal thermal environments encountered in accident scenarios. (Photo by Norman Johnson)

Explosives operations are essential to many aspects of Sandia's mission, and include capabilities such as high-velocity impacts; design, development, and testing of energetic materials and components; projectile launching; and small- to large-scale detonations.

In February 2014, to ensure the safety of these mission-critical operations, Laboratories Director Paul Himmert asked Deputy Laboratories Director and Executive VP for Mission Support Kim Sawyer to lead a team of technical and functional experts in a comprehensive review to investigate ways to improve in accordance with the safe by design intent of Engineered Safety. The team was tasked with creating an approach to explosives operations that would lead the nation in safety excellence and mission effectiveness.

As part of its review, the Explosives Operations Improvement Team interviewed stakeholders, met with a panel of explosive experts, and reviewed internal and external operational reports. The team recommended that the explosives operations currently occurring in 16 centers be consolidated into three Centers of Excellence, each with its own distinct area of expertise. Approved by the Laboratory Leadership Team, the recommendation for the three centers will consolidate technical and operational experts, establish consistency in common operations and training, and provide service to internal and external customers.

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RECHARGE, Restore, Renew at Sandia's new Energy Hub. Page 9.



ANNUAL EXERCISE tests Labs' emergency response. Page 12.

That’s that

As I write this, it’s not 9/11. Today’s not the anniversary of the terrorist attacks that took more than 3,000 lives. It’s not the anniversary of the day when 40 passengers and crew on United Flight 93 fought back, and in a doomed attempt to save themselves, saved thousands of other lives on the ground. Today’s not the 13th anniversary of that terrible day, a day we’ll always remember. Or maybe not always: One lesson from 9/11 is that history has a way of throwing horrors our way out of bright blue sunlit skies, horrors that make us forget, for a time, everything else. But for now, and until then, we remember. We remember, too, that even on that dark day there were bursts of light: acts of kindness and courage and sacrifice. We remember the everyday nobility of lives fully lived: people showing up for work, like always, supporting their families because that’s what you do, laughing with friends, chatting cordially on the long, long elevator ride to the top floors of the towers. Maybe thinking about that wonderful person you went out with the night before, someone you might love, someone you might spend your life with. Good people. All of them. Not saints, maybe not even as nice as they could or should be, but good solid people showing up for work like we all do. And then murdered, not for anything they did to anybody, but just because of where they were. They died for all of us because they could have been any of us. Today is 9/10. I write this today, not quite with dread, but with trepidation: Will our enemies mark 9/11 by visiting a new atrocity on America? We know that in their own way, 9/11 means as much to them as it does to us. But today is not 9/11. So this day, I don’t mourn the lives lost in the attacks in New York, northern Virginia, and Pennsylvania. I won’t mourn, today, the cost in lives to respond to those attacks. I will mourn them tomorrow, quietly. Today I mourn a lost world, a world that never was, that maybe never could be. With a misplaced or unfounded nostalgia, we remember the world of 9/10 as better than it really was. We see it now through a curtain of silver rain, backlit by golden light. If recalled more clearly, we remember that the pre-9/11 world had its own full measure of suffering, of conflict, of ancient grievances, but of compassion, and kindness, and new love, too. It was, that is, like our world today. At the end of the Cold War, some scholars argued that we had reached the end of history, that the big divisive issues had been resolved once and for all. History didn’t end, though, as events over the intervening years continue to remind us. As I write this on 9/10/14, the president is expected to announce this evening new military measures in the Middle East. The observation that we humans seem doomed to relive endless cycles of violence from which there is no escape is nothing new. 20th century American lawyer Clarence Darrow said, “History repeats itself; that’s one of the things that’s wrong with history.” But Darrow’s perspective is only part of the story; there’s plenty right with history, too. So on this day before 9/11, a day when I’ll be reminded again of the horrors, I choose to remember the rest of the story. Here’s American historian and philosopher Will Durant on the subject (recognizing that his language reflects the sensibilities of an earlier time): *Perhaps the cause of our contemporary pessimism is our tendency to view history as a turbulent stream of conflicts – between individuals in economic life, between groups in politics, between creeds in religion, between states in war. This is the more dramatic side of history; it captures the eye of the historian and the interest of the reader. But if we turn from that Mississippi of strife, hot with hate and dark with blood, to look upon the banks of the stream, we find quieter but more inspiring scenes: women rearing children, men building homes, peasants drawing food from the soil, artisans making the conveniences of life, statesmen sometimes organizing peace instead of war, teachers forming savages into citizens, musicians taming our hearts with harmony and rhythm, scientists patiently accumulating knowledge, philosophers groping for truth, saints suggesting the wisdom of love. History has been too often a picture of the bloody stream. The history of civilization is a record of what happened on the banks.* See you next time. – Bill Murphy (MS 1468, 505-845-0845, wtmurph@sandia.gov)

A new look Technology Showcase redesigned to spur commercialization

By Nancy Salem



A showcase that brought Sandia’s cutting-edge research and technology to the community the past two years has a new look and target audience. Instead of an annual daylong gathering open to the public, the re-envisioned Sandia Technology Showcase will be made up of several events held over a year geared to investors and entrepreneurs. The kickoff event of the new showcase will be a Sept. 25 luncheon in Albuquerque featuring some Sandia technologies with commercial appeal. The Labs partnered with the New Mexico Angels, a group of accredited angel investors who focus on early-stage companies, to unveil selected intellectual property (IP) to interested businesspeople. Sandia researchers who developed the technologies will be on hand to present.



JACKIE KERBY MOORE

Subsequent events will highlight Sandia partnership opportunities to encourage IP licensing and commercialization. Sandia’s California campus will be included, expanding commercialization efforts to a broad investment community in the Bay Area. Jackie Kerby Moore, manager of Technology and Economic Development Dept. 7933, says the change to the year-round format is intended to focus on commercialization results. The newly formatted showcase series will give Sandia the opportunity to meet and engage the entrepreneurial community and investors. “Our partnerships team at Sandia is excited about collaborating with the New Mexico Angels to launch this first event, which will bring the Sandia principal investigators and their intellectual property together with other entrepreneurs as well as funders,” she said. The September luncheon is hosted by Sandia National Laboratories, the Sandia Science & Technology Park, and the New Mexico Angels. Partners include the city of Albuquerque and Technology Ventures Corp. For more information on the showcase, visit <http://www.sstp.org/showcase>.

Retiree deaths

Louis E. Kerschion (age 79)	Jan. 18
Janice M. Sharp (88)	June 14
Lloyd E. Fuller (97)	June 24
George Kinoshita (86)	June 28
Patricia Farley (96)	June 29
Gary A. Kinemond (79)	June 29
James A. Johnson (80)	July 7
Henry K. Street (77)	July 9
Gordon G. Bennett (84)	July 11
John A. Shelnutt (68)	July 12
Frederick Perez (70)	July 13
Robert Gilbert (64)	July 14
Jose A. Guzman (92)	July 18
Vester L. Harker (90)	July 23
Bobbie L. Welch (85)	July 24
Elfides Salazar (81)	July 25
Joseph Szymanski (91)	July 25
Robert A. Randall (86)	July 26
Leon J. Keck (84)	July 27
Roger A. Baroody (89)	July 28
Howard W. Benischek (99)	July 29
Emma J. Johnson (54)	August 3
Willard H. Farness (96)	August 5
Raymond Cote (60)	August 15
Sidney B. Cook (91)	August 16
Collette T. Herrick (77)	August 19
David L. Berry (90)	August 22
Jack W. Reynolds (90)	August 22
Howard M. Jones (81)	August 24
Robert B. Trujillo (48)	August 31
Viola Rael (71)	September 6



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Jane Ann Lamph named to 15th Assembly District's 2014 STEM Women of the Year

By Emmeline Chen

Sandia engineer Jane Ann Lamph, manager of B83 System Engineering Dept. 8237, was recently named as one of the 15th Assembly District's 2014 STEM Women of the Year by Assemblymember Nancy Skinner.

The award celebrates women and organizations that have made groundbreaking contributions in research and technology and helped advance and inspire women and girls to pursue science, technology, engineering, and math (STEM) careers.

At the June 26 ceremony honoring Jane Ann and the other award recipients, Skinner said, "Today, we celebrate East Bay women pioneers in the fields of science, technology, engineering, and math. The women and organizations honored are fueling innovations, new technologies, and breakthrough research to benefit people and our economy. And they lead by example, inspiring other women and girls to excel in STEM fields."

In his nomination letter, Russ Miller, director of California Weapons Systems Engineering Center 8200, described Jane Ann as a recognized leader at Sandia who "exemplifies STEM leadership both through her broad engagement with organizations that focus on STEM and the personal connections she has made throughout her career at Sandia."

Encouraging women in STEM has been Jane Ann's



JANE ANN LAMPH

passion for more than 35 years. She herself was inspired to pursue mechanical engineering by a woman engineer who visited her high school AP calculus class. After graduating from the University of Utah in 1980 as the only female mechanical engineering major, Jane Ann made it her mission to ensure girls and young women understand the importance and value of math, science, and technology in their daily lives.

As an engineering undergraduate, she helped found a student section of the Society of Women Engineers (SWE) and served as a board member of the Utah Math Science Network, which encouraged girls to develop their interests in math and science. To this day, Jane Ann serves as a female role model wherever she goes — as an active recruiter and speaker at Evenings with Industry, at Expanding Your Horizons in Math and Science conferences, Sandia Math & Science Awards events, Sandia Science Carnivals, DOE Science Bowls, and local science fairs.

"Jane Ann has touched the lives of countless women and girls, resulting in many of them pursuing careers in STEM fields," says Julia Gee, a Fellow of the American Society of Mechanical Engineers (ASME) and a past president of the UC Berkeley Engineering Alumni Society (EAS).

In 1981, Jane Ann began her Sandia career as a mechanical engineer. She became manager of the Environmental Test Department in 1991 and has continued to take on technical leadership roles of increasing influence and

responsibility. She was a leader in hosting the first DOE Programs for Women event and led Sandia's participation in a national leadership conference sponsored by the American Association of University Women. Both events were aimed at encouraging girls to enter STEM fields.

In response to the Presidential Commission on the Advancement of Women and Minorities in Science, Engineering, and Technology, Jane Ann and her team conceived of and she co-chaired a West Coast Region Forum that focused on strategies to help attract and retain women in technical roles. The forum's policy recommendations were incorporated in to the commission's report and adopted by the National Academy of Science Committee.

Jane Ann "made a point of welcoming new technical women into Sandia, graciously volunteering her own time to mentor new scientists," says Cathy Branda (8623), manager of the Systems Biology department and current chair of the Sandia Women's Committee. "In my current roles, I think upon the exemplary mentorship I received from Jane Ann and do my best to offer young scientists the fostering care that Jane Ann provided me."

As a successful engineer for more than 30 years, Jane Ann has been recognized for her many technical contributions. She graduated from UC Berkeley with a master's in mechanical engineering and has undergraduate degrees in mechanical engineering and business management from the University of Utah. Jane Ann is an active member and has held various officer positions in multiple professional associations, including the UC Berkeley EAS, ASME, SWE, Tau Beta Pi, the National Society of Professional Engineers, the California Society of Professional Engineers, and the Professional Business Women of California.

Sandia California News

Robert Barlow awarded Combustion Institute's Alfred C. Egerton Gold Medal

By Patti Koning

Sandia scientist Robert Barlow (8351) was awarded the Alfred C. Egerton Gold Medal at the 35th International Symposium on Combustion in San Francisco on Aug. 6. Presented every two years by the Combustion Institute, the award recognizes "distinguished, continuing, and encouraging contributions to the field of combustion."



ROBERT BARLOW, left, with former Sandian and current research collaborator Simone Hochgreb of Cambridge University, who presented him with the Alfred C. Egerton Gold Medal at the 35th International Symposium on Combustion.

Lawrence Harding of Argonne National Laboratory won the Bernard Lewis Gold Medal for "brilliant research in the field of combustion" and Paul Clavin of Aix-Marseille Université in France won the Ya B. Zel-

dovich Gold Medal "for outstanding contribution to the theory of combustion or detonation."

Robert was honored for "pioneering contributions to simultaneous laser diagnostics and their application to the understanding of turbulence-chemistry interactions in flames." He has developed unique experimental capabilities that combine measurements of Raman scattering, Rayleigh scattering, and laser-induced CO fluorescence with crossed planar flame sheet imaging.

Taken together, these measurements yield a wealth of information regarding the flame structure — including the temperature, major species, mixture fraction, reaction progress, and the gradients of these quantities — with high precision and spatial resolution.

This work is leading to an improved understanding of the fundamental nature of turbulent combustion and also provides detailed data sets for developing and evaluating computer models that will eventually be used to design advanced combustion systems for transportation and power generation. Robert is also well-regarded in the combustion community as an advocate for international collaborative research and the main organizer of the Turbulent Nonpremixed Flames workshop series on the measurement and computation of turbulent flames.

"This is a significant honor that is both thrilling and humbling because there are many people who contributed to the body of work that is being acknowledged, and there is a lot more work to be done," says Robert.



KATHARINA KOHSE-HOINGHAUS, president of the Combustion Institute and a professor at the University of Bielefeld, opens the 35th International Symposium on Combustion, which was held in San Francisco Aug. 4-8. For more, see page 5.

Robert is the second Sandia employee to be awarded a Gold Medal by the Combustion Institute. Jim Miller, now retired, won the Bernard Lewis Gold Medal at the 31st International Symposium on Combustion in Heidelberg, Germany.

Robert received his PhD and MS in mechanical engineering from Stanford University and his BA in chemistry from Amherst College. He was a program co-chair for the 34th International Symposium on Combustion (Warsaw, 2012) and served as editor of the *Proceedings of the Combustion Institute* (2003–2007). He is an editorial board member of *Combustion Theory and Modelling* (1996–present) and is a past editorial board member of *Progress in Energy and Combustion Science* (2002–2004).

Sandia consolidates explosives operations

(Continued from page 1)

The Centers of Excellence will be:

1) Engineering Sciences Center 1500, led by Director Justine Johannes, will be responsible for environmental testing and characterization of explosive components and systems.

2) Energetic Components Center 2500, led by Director Anthony Medina, will be responsible for explosive chemistry research and development as well as the development and testing of explosive components for the nuclear weapon program.

3) Integrated Military Systems Center 5400, led by Director David Keese, will be responsible for field testing of explosive systems, launching rockets and advanced flight systems that use explosive components, and the development and test of conventional warheads.

The Centers of Excellence will collaborate to establish key operational and businesses processes, including structured and rigorous work planning and controls; formal training and qualifications; facilities and infrastructure maintenance; objective performance assurance; equitable cost model; and an evaluation and reward system.

Establishing communities of practice

As part of the managerial construct for the new Centers of Excellence, an



LAB 1215's 1kg walk-in high explosives chamber is one of two test-firing chambers inside the Explosive Component Facility designed to contain the effects of repeated tests involving up to 1,000 grams of TNT-equivalent explosives. (Photo by Norman Johnson)

the transition to the three center model in October. Phase two of the implementation will focus on the transition of work to the new COE safety construct, while Phase Three will emphasize the implementation of various high payoff performance assurance improvement actions. The final phase will focus on sustainment and continuous improvement.

Explosives Operations Board (EOB) is being developed. The senior managers assigned to this board will work together to form a centers-wide "community of practice" to share best practices, perform cross-organization assessments, jointly monitor explosive operations, and ensure consistency in operational rigor. Under the EOB, subcommittees of operational and technical experts will work with line and management personnel to focus on safety preparedness, developing new explosives, explosives storage, and management system oversight.

"The Centers of Excellence and community of practice will leverage an unprecedented depth of explosives experience, giving us the opportunity to re-examine the safety and efficiency of our operations using our existing work planning and controls and applying the principles of engineered safety," says Anthony. "This new construct will set the standard for other hazardous operations."

These operational and structural changes will occur in a multi-phased approach, starting with the transition to the three center model in October. Phase two of the implementation will focus on the transition of work to the new COE safety construct, while Phase Three will emphasize the implementation of various high payoff performance assurance improvement actions. The final phase will focus on sustainment and continuous improvement.

In-flight testing

(Continued from page 1)



THE STRUCTURAL HEALTH MONITORING SENSORS are custom built to fit an aircraft's parts. They can be mounted in hard-to-reach areas of an aircraft so that mechanics can plug in to acquire the data without the time, cost, and risk of removing parts from the aircraft. (Photo by Randy Montoya)

The team says that so far the sensors installed on the aircraft are working as expected.

By 2015, Sandia intends to present the flight and laboratory test results to the FAA for approval and certification. Should the FAA approve the sensors, they would be available for specific applications across the entire airline industry and the process for certifying future applications should be more efficient because of the research being conducted now.

In September, a team from the Airworthiness Assurance Nondestructive Inspection Validation Center (AANC) operated by Sandia for the FAA will receive the 2014 Airlines for America Nondestructive Testing Better Way Award for establishing the sensitivity, durability, and repeatability of applying SHM solutions on commercial aircraft. The award honors team members from the FAA; Delta; Boeing Co.; Structural Monitoring Systems Inc.; and Canadian-based Anodyne Electronics Manufacturing Corp. The award recognizes the year's most outstanding innovation for aircraft maintenance based on technology advancement and cost-effectiveness.

Two SHM systems reach maturity for use on regular flights

Sandia began its work in the aviation safety arena in 1991 when the FAA, in response to a number of aviation incidents, increased its research efforts to improve inspection, maintenance, and repair of commercial aircraft. Among the projects to improve aviation safety, the FAA created the AANC, operated by Sandia, to conduct research into nondestructive inspection (NDI), advanced materials, engines, structural integrity, and a wide range of other airworthiness assurance areas.

The center provides a way to develop, evaluate, and bring new aircraft technologies to the airline industry, Dennis says. "We work to make the technology viable and often focus on that last phase of technology validation and certification."

The current SHM program is testing two sensors: Comparative Vacuum Monitoring (CVM) sensors manufactured by Structural Monitoring Systems and piezoelectric sensor arrays produced by Sunnyvale, Calif.-based Acellent Technologies Inc.

• CVM sensors improve crack detection by monitoring "galleries," or 0.025-inch channels etched by laser into the Teflon sensor. CVM sensors are then mounted in areas of the aircraft known to experience fatigue. The sensors are bonded to the surface of the structure with an adhesive surface preparation that seals out the atmosphere, creating a vacuum inside the gallery. When a tiny crack intersects the gallery, the pressure changes, much like the pressure in a vacuum cleaner changes when the hose has a leak. The sensor records the pressure change and alerts inspectors, well before the crack becomes a safety issue.

• Piezoelectric sensors (PZT) are strategically distributed in polyimide films, called Acellent's SMART Layers, which adhere to an airplane's surface to monitor specific regions for damage. The array of PZT sensors communicate with one another by transmitting and receiving ultrasonic surface waves called Lamb waves. This creates a mini-communications network. Damage to the aircraft disrupts or changes the signal patterns from the baseline communication signals. Acellent's software measures and analyzes any changes, called the "damage index," and sends an alert to the inspector. Work is ongoing on the best spacing and placement for these sensors on aircraft, Sandia mechanical engineer Stephen Neidigk (6621) says.

Both of these on-board sensors must meet the same performance and reliability standards as those required for current maintenance inspections, Dennis says. "The SHM systems also help eliminate some of the concerns about human factors associated with manually deployed NDI," he says. "You have the sensor in place, you know it works and it's giving you a proper signal, whereas an inspector must manually orient the inspection probe properly each time and there are always concerns about human vigilance when inspections become time-consuming or tedious."

The sensors are custom built to fit an aircraft's parts, they are verified to be in working order before they are sealed inside the aircraft, and the readouts provide inspectors with a "pass" or "fail" decision so the results can't be misinterpreted, the researchers say.

Sandia also is researching wide-area monitoring using piezoelectric and fiber optic strain sensors for composite materials used in today's aircraft. Impacts don't always show dents in composite materials, so SHM techniques are needed to find structural damage within what appears to be a smooth, undamaged surface, Stephen says.

Field tests bridge gap from lab to routine use in aircraft

The field tests have helped fine-tune the sensors so that they can withstand the harsh environments aircraft fly in and the environment aircraft mechanics work in, neither of which is as pristine as the laboratories where the sensors were initially tested.

For example, field testing showed that mechanics working in the cramped bowels of an aircraft couldn't see well enough to connect the sensors' tubes together by hand, Stephen says. So the team designed snap-clip

type connectors for the CVM sensors, like those used to plug a telephone landline into a wall outlet.

"With the snap-click connectors, they are able to feel them click together, which is easier than the previous method of connecting tiny tubes individually by hand," Stephen says.

Growing realistic cracks part of Sandia performance tests

Complementing the in-flight tests, Sandia is looking at the sensors' ability to detect cracks and at how well they perform in extreme environmental conditions.

In the laboratory, Sandia engineer Tom Rice (6621) breaks things for a living, but that's not as easy as it sounds. The cracks he "grows" have to represent cracks found on an airplane. So, for example, he places a pale green wing box fitting on a load frame that mimics the stress conditions that part would experience on an aircraft. After about four hours of accelerated fatigue cycles, a crack begins to show.

"We literally have to grow the crack enough to where it stays open (without the load on it), so our sensors can detect the crack when the aircraft is in an unloaded state in the maintenance hangar," Tom explains.

Once the sensors have detected an array of cracks, Sandia assembles various test scenarios and collects the data to calculate the statistical probability of detection for cracks of various lengths, typically fractions of inches.

In hundreds of laboratory tests, the sensors have never issued a false call, Tom says.

Future of SHM can reduce costs, enhance safety for airline industry

If flight tests verify that the sensors can be used to help monitor airliners' structural health, the Sandia researchers hope to see a more comprehensive SHM program follow.

In addition to safety enhancement, SHM would save the airline industry time and money, particularly if sensors are mounted in hard-to-reach areas and used widely throughout an aircraft, Dennis says.

With today's routine maintenance, inspectors often need to remove a cabin's interior seats or galleys to conduct inspections. But with the on-board sensors mounted in place, the mechanics can plug in from a convenient location to acquire the sensor data without the time and cost of removing items, Dennis says. Such part removal also introduces the possibility of damaging the structure during disassembly.

Researchers hope SHM eventually will permit the real-time condition of the aircraft to dictate maintenance. "The ultimate goal is to monitor it in-flight and have it tell you 'I need some attention, I've got a problem here.' So you do condition-based maintenance rather than time-based maintenance," Dennis says. "That's downstream a ways, but these are all building blocks working toward that."

Tom adds that with SHM abnormal problems that show up prior to scheduled maintenance would be detected with real-time sensors. "With condition-based maintenance, you could find damage earlier than normal," he says. "It's rare that it happens, but it could."

Such early damage detection and repairs provided by SHM also are cost-effective because they reduce the need for subsequent major repairs, Dennis says.

35th International Combustion Symposium a resounding success

• Photos by Dino Vournas •

The 35th International Combustion Symposium, the premier conference on combustion science and application, was held Aug. 3–9 in San Francisco and was a resounding success, thanks in no small part to Sandia’s Combustion Research Facility (CRF). More than 1,500 researchers gathered from around the world to discuss the latest innovations in understanding and predicting combustion-related phenomena, approximately 250 more than had ever previously attended this biennial event.

The symposium itself was largely organized by Sandia, with Chris Shaddix (8351), Jackie Chen (8351), and Melissa Betz (8539) leading the local organizing committee. Judit Zador and Ahren Jasper (both 8353) organized the 690 contributed posters. Jonathan Frank (8351) and Chris served as co-chairs of colloquia on Turbulent Flames and Heterogeneous Combustion.

CRF researchers also helped organize three different technical workshops held just before the start of the symposium: Turbulent Nonpremixed Flames (TNF) workshop, Robert Barlow (8351); International Sooting Flame (ISF) workshop, Chris; Flame Chemistry Workshop, Nils Hansen (8353). Seventy participants in the TNF and ISF workshops also enjoyed optional tours of the CRF.



ELAINE ORAN, a professor of engineering at the University of Maryland, gave the keynote address on “Understanding explosions: From catastrophic accidents to the creation of the universe.”



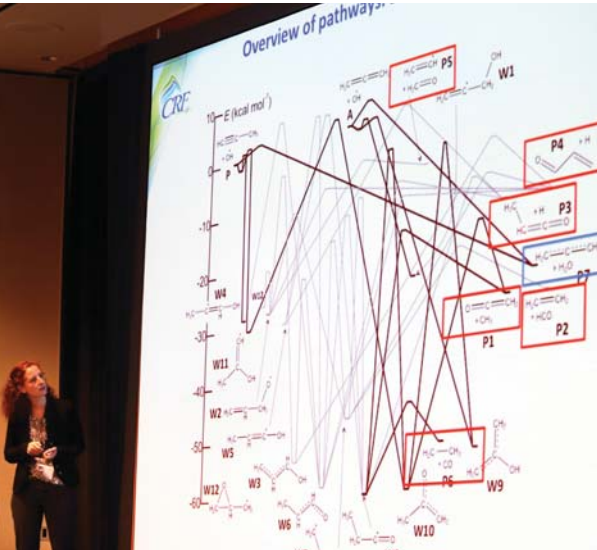
THE CRF REUNION LUNCHEON, held during the symposium, brought together a number of current staff, retirees, past and present postdocs, and other visitors, including three CRF directors past and present: Bob Carling (2008–13), Bob Hwang (current), and Bill McLean (1993–2005).



HAMMING IT UP for the camera are, from left to right, CRF researchers Ethan Eagle (8362) and Mark Musculus (8362); Sebastian Kaiser, a professor at the University of Duisburg-Essen and a former postdoc and Sandia staff member; and Gilles Bruneaux of France’s IFP Energies Nouvelles (IFPEN).



TECHNICAL UNIVERSITY OF VIENNA professor Franz Winter, left, a former visiting researcher, catches up with Chris Shaddix (8351) at the reunion lunch.



JUDIT ZADOR (8353)presents “Adventures on the C 3H5O potential energy surface: OH + propyne, OH + allene and related reactions,” research conducted with Jim Miller, a retired Sandian. Sandia researchers authored or co-authored 33 of the 435 oral presentations given at the event.

STATE OF THE LABS
DIVISION PRESENTATIONS

OUR
STRATEGIC
JOURNEY
presented by
Paul Hommert
President and Laboratories Director

Starting September 24

*For dates and times of your division's
meeting, see Around Sandia.*

Family Day 2014

Activities • Events • Demonstrations

This is a listing of activities, events, and demonstrations that had not been confirmed in time to appear on page 6 of the *Lab News* dated Sept. 5. The combination of this material and that earlier *Lab News* page gives you a com-

plete menu of activities for Family Day 2014. A single, printable document that shows all of this material is available on the Family Day 2014 website (<http://family-day.sandia.gov>) under the Activities tab.

Division 1000

Bldg. 970	HERMES III/RITS 6 Viewing Deck (Top Floor) - Come view the world’s most powerful gamma ray accelerator. This activity is popular — wait times expected — please plan accordingly. 10 am-2 pm
Bldg. 981	Saturn — Come meet Z’s little, older brother with a guided tour — each tour will take about 30 minutes starting at 10 am. This activity is popular — wait times expected — please plan accordingly. 10 am-2 pm
Bldg. 865 CERL	Wind Tunnel Tours. 9 am-12 pm Demonstration videos of the Tracer Fire Lab, Human Performance Lab, and the Visualization Lab. Sandia creates photorealistic animations, based on simulation data. These animations are easier for non-scientists to understand and help communicate science to the public. 9 am-3 pm
Bldg. 858EL/L1500 Bldg. 858S/1004	Bldg. 858 Complex Family Day Open House — Videos on “Microsystems Engineering Science Applications, MESA” projects will be shown in various conference rooms around the complex. . . . 9 am-3 pm
Bldg. 858EL Lobby/break room	Bldg. 858 Complex Family Day Open House — Mind Teasing Puzzles — Poster-sized puzzles & optical illusions to dazzle and baffle our workforce and their family members. 9 am-3 pm
Bldg. 858S Break Room (Near entrance to 858N - Silicon Fab)	Bldg. 858 Complex Family Day Open House — Willis Whitfield, Clean Room Inventor — Be sure to visit the display case containing the original lab notebook of Sandia engineer Willis Whitfield, who was responsible for the clean room invention. <i>Time</i> magazine articles regarding his invention. . . 9 am-3 pm
Bldg. 858S 858EL/L1500 & 858S/1004858	858 Complex Family Day Open House – “A Century of Physics” — 2nd floor hallway, Permanent poster display of famous scientists who helped change our world. . . . 9 am-3 pm

Division 2000

Bldg. 899/1702	The B61-12 Life Extension Program will showcase a hollow, life-size B61-12 model, various videos of tests, and a game to test your knowledge of the B61-12. 9 am-3 pm
Bldg. 894/146	Liquid Nitrogen Ice Cream — People can learn about the cold temperature of liquid nitrogen through making edible ice cream. Please contact Joanna Chavis (jcchavi@sandia.gov) for tickets to this experiment. 1 pm-3 pm
Bldg. 894/136A Bldg. 894/139A	Photo Booth 9 am-11 am 3-D Printing — 3-D printing is a process of making three-dimensional solid objects from a digital file. The creation of a 3-D printed object is achieved using additive processes. 9 am-3 pm
Bldg. 894/146	Copper to Silver Experiment — In a display of alchemy, copper pennies are turned into silver and finally to gold. Please contact Joanna Chavis (jcchavi@sandia.gov) for tickets to this experiment. 9:30 am-10:30 am
Bldg. 905/103E&W	Showcasing Work Activities in our Facilities — Staff will show how an explosive component is made from start to finish, to include its design, production, and testing. Guests will be able to view a bridge-wire under a microscope. The 3-D printer will be another feature. Videos will play non-stop throughout the day to showcase explosions taking place in the labs and out in the field. 9 am-3 pm
Bldg. 905/1208 & 1210	Demonstrations — Using various imaging techniques, light, laser confocal, and scanning electron microscopes, we will explore the nanometer and micron-sized world. One of the numerous things we will be looking at is a tiny insect, more than likely in your house and yard. 9 am-3 pm
Entrance of Bldg. 870	Neutron Generator Subassembly poster board display. Continuous looping of Neutron Generator video. 9 am-3 pm

Division 5000

Bldg. 810E Hallway outside CNSAC Auditorium in front of C109 Bldg. 962 Aud. Lobby various projects. Tech Area IV	National Security Technology Exhibit illustrating how Sandia does “science with the mission in mind.” The exhibit will be geared for younger visitors. 9 am-2 pm Center 5400 Displays - Posters and art of the organization’s various projects 9 am-3 pm Area IV Antenna Demonstration of transmitting encrypted messages, receiving and decrypting them over the air. This demo represents the RF transmissions to/from satellites and their ground stations. (30-minute demo slots) 9 am-11 am & 1 pm-3 pm
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Important late change for Family Day 2014 hosts

The Security Plan for Family Day 2014 has been amended. This requires each host to carry a printed copy of their registration form while at the event.

To do this, you must access your registration confirmation email. It was addressed from “SharePoint Admin” with a subject line of “Family Day Registration Confirmation.” Then follow these directions.

Step 1: Find confirmation letter in your email. If you did not retain it, contact Pam Catanach, pcatana@sandia.gov.

Step 2: Select View and Edit Registration Form.

Step 3: Print this so that you can see all the guest information.

Step 4: Carry the form with you on Family Day.

Bldg. 880 Suites 5 & 9	Cloud Computing Video Presentation — What exactly is cloud computing? Our 10-minute video presentation will elucidate cloud computing trends and processes. 9 am-3 pm
Bldg. 891/1502	PANTHER Eyetracking: Finding the Needle in the Haystack - Learn how your visual system works by playing “Where’s Waldo?” while we track your gaze patterns. We’ll show you where you looked, how long you spent looking. Unfortunately, the eyetracker doesn’t work as well if you wear thick glasses or bifocals, but you can still search for Waldo! 9 am-12 pm
Bldg. 810 Lobby	Harvester Pod Demonstration - The Harvester Particulate Airborne Collection System is flown on an aircraft, guiding its specially trained users toward radioactive debris thrown into the air from a nuclear detonation. 9 am-3 pm. 15 minutes per group.
890 Lobby	Flight Hardware Display 9 am-3 pm

Division 6000

Robotic Vehicle Range	Robotic Vehicle Range — Sandia’s Intelligent Systems, Robotics, and Cybernetics group will host a variety of robotic demonstrations and displays at the Robotic Vehicle Range. This is a popular activity so please plan accordingly. 9 am-noon
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Division 8000

Bldg. 1008/154	SCRUM — It is for more than rugby. How we use this agile approach for project planning. Hands- on demonstration and application. 9:30-10 am & 10-10:30 am
Bldg. 848/conf. room	Learn about photovoltaic technology and related Sandia research (indoor) — We will have a display of inverters (residential and microinverters), PV cells, PV modules, and pyranometers. We will explain how PV systems work using a diagram and will let visitors touch and ask questions about the devices. 10 am-noon & 1-3 pm
Bldg. 848	Learn About Photovoltaic Technology and Related Sandia Research (outdoor guided tour) — We will lead people along the south end of PSEL to view various fixed and tracking test PV systems and our state-of-the-art weather station. This tour must be strictly guided at all times for safety reasons. The outdoor tour will be offered approximately every 30 minutes. 10 am-noon & 1-3 pm
Bldg.1008/154	Infrastructure Consequence Analysis at the National Infrastructure Simulation and Analysis Center (NISAC), a joint program between Sandia and Los Alamos, directed by the Department of Homeland Security (DHS) Office of Cyber and Infrastructure Analysis (OCIA). 10:45 am-11:15 am

Division 9000

Research Park CERL Room 185	RECOIL Facility and Tracer FIRE/Dragonfly Cyber Attack Demonstration - The RECOIL facility is a multi-disciplinary lab combining various research disciplines with cyber security practitioners, cognitive scientists, neuroscientists, and computer scientists all contributing. Tracer FIRE was built by the RECOIL team members to enhance our understanding of what makes experts so good at solving very difficult complex problems like those encountered in the field of cybersecurity. 10 am-1 pm
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Family Day 2014

Here’s a potpourri of Family Day special-attention items

Some important last-minute announcements

It should come as no surprise that information about a dynamic, evolving event like Family Day 2014 is subject to last-minute changes.

Those are listed below, along with some very important reminders all designed to help you and your guests have as positive an experience as possible at this periodic open house, of sorts, that takes place from 9 a.m.-3 p.m. on Saturday, Sept. 20.

In the case of bad weather

Weather generally is good for these events (yes, there were those winds in 2009), but it’s important to be aware of this year’s bad-weather backup plan. Here it is.

In case of severe weather, Hardin Field activities will be moved to several locations. HBE activities will move to the Bldg. 823 breezeway. The Hardin Field-based lunch distribution will move from the grass area to a nearby refrigerated truck. Science, technology, engineering, and math (STEM) activities, exhibits, and demos will relocate into kitchen areas in IPOC, which is off base east of the intersection of Eubank and Innovation Parkway.

The Steve Schiff Courtyard lunch distribution will move to a nearby refrigerated truck.

Getting onto and around base

- Be cautious while driving on Kirtland Air Force Base and observe speed limits. Also, remember that driving on base during a weekend is somewhat different than on weekdays. In particular, be aware that most base traffic lights will be on “weekend mode” – flashing yellow one way, red the other.
- The Wyoming Gate will be closed, so you will have to seek out the base’s Gibson and Eubank gates or the Sandia Contractor Gate, which is south of the Eubank Gate at the intersection of Eubank and Technology Parkway SE. To attend, you and your guests must be registered and have your name on the Base Access List, a DBIDS requirement. Bring your DOE-issued security badge to present at the gate. Any guest over age 18 must have a valid form of ID ready for verification, if asked to present it.
- Even though the escort limit is eight people, you are allowed to bring only the maximum number you can have seat-belted in your vehicle. There will be no vouching for a second, trailing vehicle.

Safety

- Don’t let your guard down for a minute. Remember, every host bringing guests will be serving not only as an escort but will be the first line of safety awareness for her or his guests.
- While showing your party around, say in one of the technical areas, don’t be surprised if you find a few situations where it’s not possible to get from Bldg. A to Bldg. B as you normally do.
- Some entryways for a few buildings may not be available and you’ll have to enter through an alternate door.
- Paramedics and First Aid stations will be on Hardin Field.

Escort responsibilities

- Ensure that classified and sensitive unclassified information are protected.
- Area I’s Gate 10 bypass is the location that should be used by parties with strollers, wheelchairs, or other limitations that would prevent any of the party’s members from using turnstiles.

Security

- Although not required, it probably makes good sense — if possible — to leave things like handbags, purses, and backpacks locked in vehicles. Doing so ought to reduce the chance of someone inadvertently bringing a prohibited item — an ever-present cell phone or a tiny electronic device with recording capabilities, for instance — into Limited Areas.
- It is the responsibility of line organizations to ensure that classified matter is stored according to Corporate Process Requirements. No classified computer or networks are to be accessed in areas participating in Family Day 2014.
- Access to SCIFs is not permitted for Family Day 2014.

Many Divisions add to the list

Impressive number of new things to do and see announced

Take a close look at the updated list of Family Day 2014 activities, events, and demonstrations that is on page 6. (Note: These are in addition to activities listed in the Sept. 5 Lab News.)

If you don’t, your guests are likely to miss some interesting things about what Sandia does to fulfill its broad national security responsibilities and contributions.

Here are some examples of those new items listed by division.

Div. 1000

- Div. 1000 is again offering some of the historically more popular activities at the Z Facility, HERMES, and Saturn, all in Area IV. Based on the most recent Family Day events, it is prudent to be prepared for some lines, so plan accordingly.
- The Z Facility’s self-guided tours will be available in Bldg. 983 from 12 p.m.-3 p.m. Open-toed shoes, food, and drinks will not be permitted inside the facility.
- Saturn, Z’s little, older brother will have guided 30-minute tours. Bldg. 981. 10 a.m.-2 p.m.
- The HERMES III and the Radiologic Integrated Test Stand (RITS 6) event will provide visitors the opportunity to view the world’s most powerful gamma ray accelerator from a top-floor vantage point. Bldg. 970. 10 a.m.-3 p.m.

Div. 2000

- There will be hands-on demos in the Temperature Lab of thermocouples showing some common things that can go wrong with temperature measurements. Bldg. 827/155. 9 a.m.-11 a.m.
- Length Mass Force Lab demos showing some of the facility’s high-precision capabilities will run every 20 minutes starting at 9 a.m. Each demo will be limited to 15 people. Bldg. 827/120. 9 a.m.-11 a.m.

Div. 5000

- The National Security Technology Exhibit, geared to younger visitors, will illustrate how Sandia does “science with a mission in mind.” Showcased technologies: sticky, containment, and decon foams and micro-optical radar used on shuttle missions, and others. Bldg. 810E. 9 a.m.-2 p.m.
- PANTHER Eyetracking: Finding the Needle in the Haystack is an activity that will help visitors better understand how one’s visual system works by playing “Where’s Waldo?” while a visitor’s gaze patterns are checked. It’s another youngster-oriented activity. Unfortunately, the eyetracker doesn’t work with thick glasses or bifocals. Bldg. 891/1502. 9 a.m.-12 p.m.

Div. 6000

- There will be indoor and outdoor opportunities to learn about Sandia’s history-filled photovoltaic (PV) technologies. For the indoor offering, there will be explanations of how PV systems work using a diagram and by letting visitors touch and ask questions about devices. There will be a short tour of the PV characterization lab. Bldg. 848/conference room. 10 a.m.-12 p.m. and 1 p.m.-3 p.m. For the outdoor version, participants will be led along the south end of the Photovoltaic Systems Evaluation Laboratory to view fixed and tracking test PV systems and then into the PV Module Museum. Bldg. 848. 10 a.m.-12 p.m. and 1 p.m.-3 p.m.

In case of an emergency
Dial 911 from any Sandia phone or 505-844-0911 from a cell phone.
Remain calm, follow directions, and do not interfere with responders.
Report any injuries or incidents — safety or security-related — to OOPS, by dialing 311 from any Sandia phone.



Year-by-year walk through time

What’s happened at Sandia in the science/technology world since Family Day 2009

Late 2009

Boeing, Caltrans, other industry partners join with Sandia on new mobile lighting application. Research by a team of Sandia/University of New Mexico scientists successfully demonstrates in a lab what may be better way to stop MRSA before it becomes dangerous.

2010

Tonopah Test Range reopens for business. Sandia steam plant demolition marks new era of better heating efficiency, fewer emissions. Sandia honors former executive EVP Jack Howard for nuclear weapons work and starting Labs’ California site. Ion Beam Lab opens to extend materials analysis capability. Sandia device helps US troops in Afghanistan disable deadly improvised explosive devices.

2011

Sandia security experts help Kazakhstan safely transport and store Soviet-era bomb materials. Sandia’s CANARY software protects water utilities from terrorist attacks and contaminants. Labs researchers develop super-resolution microscopy. Sandia and Cray agree to partner and tackle big data issues. Self-guided bullet prototype developed at Sandia can hit target a mile away.

2012

Sandia is one of “greatest research institutions in the world,” visiting Energy Secretary Steven Chu says. Sandia working to improve nervous system control of prosthetics. Sandia helping nation find best way to protect infrastructure, recover from disasters. Retired Sandian Willis Whitfield, inventor of modern-day laminar-flow clean room, the enabler for the modern microelectronics industry, passes away.

2013

DOE/Sandia Scaled Wind Farm Technology facility commissioned in Lubbock, Texas. Labs brings home a record five regional tech transfer awards. Sandia conducts B61-11 pull-down surveillance test, the first in years. Popcorn’s particle pathways promise better-performing lithium-ion batteries. Alloy developed at Sandia has potential for downhole electronics applications in wells.

Early- to Mid-2014

Labs’ human studies work improves airport security. Sandia technology is licensed to produce US supply of widely used Moly 99, an in-demand medical rad source.

Sandia magnetized fusion technique produces significant results

By Neal Singer

Sandia researchers have produced a significant output of fusion neutrons, using a method fully functioning for only little more than a year.

The experimental work is described in a paper to be published in the Sept. 24 *Physical Review Letters* (PRL) online. A theoretical PRL paper to be published on the same date helps explain why the experimental method worked. The combined work demonstrates the viability of the novel approach.

Says senior manager Dan Sinars (1680), “We are committed to shaking this [fusion] tree until either we get some good apples or a branch falls down and hits us on the head.” He expects the project, dubbed MagLIF, for magnetized liner inertial fusion, will be “a key piece of Sandia’s submission for a July 2015 NNSA review of the national Inertial Confinement Fusion Program.”

MagLIF uses a laser to preheat hydrogen fuel, a large magnetic field to squeeze the fuel, and another separate magnetic field to keep charged atomic particles from leaving the scene.

Inertial confinement fusion creates nanosecond bursts of neutrons, ideal for creating data to plug into supercomputer codes that test the safety, security, and effectiveness of the US nuclear stockpile. Down the road, if the individual fusion pulses can be sequenced like an automobile’s cylinders firing, the method could be useful as an energy source.

It only took two magnetic fields and a laser, focused on a small amount of fusible material called deuterium (hydrogen with a neutron added to its nucleus), to produce a trillion fusion neutrons (neutrons created by the fusing of atomic nuclei). Had tritium (which carries two neutrons) been included in the fuel, scientific rule-of-thumb says that 100 times more fusion neutrons would have been released. (That is, the actual release of 10 to the 12th neutrons would be upgraded, by the more reactive nature of the fuel, to 10 to the 14th neutrons.)

Technique is still a toddler

Even with this larger output, to achieve break-even fusion — as much power out of the fuel as placed into it — 100 times more neutrons (10 to the 16th) still would have to be produced. The gap is sizable, but the technique is a toddler, with researchers still involved in figuring out the simplest measures: how thick or thin key structural elements of the design should be, and the relation between the three key aspects of the approach — the two magnetic fields and the laser.

The first Sandia paper, “Experimental Demonstration of Fusion-Relevant Conditions in Magnetized Liner Inertial Fusion,” [MagLIF] by lead authors Matt Gomez (1683), Steve Slutz, and Adam Sefkow (both 1684), describes a fusion experiment remarkably simple to visualize. The deuterium target atoms are placed in a long thin tube called a liner. A magnetic field from two pancake-shaped Helmholtz coils above and below the liner creates an electromagnetic curtain that prevents charged particles, both electrons and ions, from escaping. The extraordinarily powerful magnetic field of Sandia’s Z machine then crushes the liner like an athlete crushing a soda can, forcefully shoving atoms in the container into more direct contact. As the liner begins to be crushed, a laser beam preheats these deuterium atoms, infusing them with energy to increase the chance of them fusing at the end of the implosion. (A nuclear reaction occurs when an atom’s core is combined with that of another atom, releasing large amounts of energy from a small amount of source material. That outcome is important in stockpile stewardship and, eventually, in civilian energy production.) Trapped energized particles including fusion-produced alpha particles (two neutrons, two protons) also help maintain the temperature of the reaction at a high level.

“On a future facility, trapped alpha particles would further self-heat the plasma and increase the fusion rate, a process required for break-even fusion or better,” says Adam.

The actual MagLIF procedure follows this order: The Helmholtz coils are turned on for a few thousandths of a second. Within that relatively large amount of time, a 19-megaAmpere electrical pulse from Z, with its attendant huge magnetic field, fires for about 100 nanoseconds (less than a millionth of a second), with a power curve that rises to a peak and then falls in intensity. Just after the 50-nanosecond mark, near the current pulse’s peak intensity, the laser, called Z-Beamlet, fires for



AT THE HEART OF SANDIA’S Z MACHINE, Matt Gomez (1683), left, presents an idea to Steve Slutz (1684), right, while Adam Sefkow (1684) looks on. (Photo by Randy Montoya)

several nanoseconds, warming the fuel.

Slower pace = More fusible reactions

According to the paper’s authors, the unusual arrangement of using magnetic forces both to collapse the tube and simultaneously insulate the fuel, keeping it hot, means that researchers could slow down the process of creating fusion neutrons. What had been a precipitous process using X-rays or lasers to collapse a small unmagnetized sphere at enormous velocities of 300 kilometers per second, can happen at about one-quarter speed at a much more “modest” 70 km/sec. (Modest only comparatively; the speed is about six times greater than that needed to put a satellite in orbit.) The slower pace allows more time for fusible reactions to take place. The more benign implosion also means fewer unwanted materials from the collapsing liner mix into the fusion fuel, which would cool it and prevent fusion from occurring. By analogy, a child walking slowly in the ocean’s shallows stirs less mud than a vigorously running child.

Commenting on these phenomena, Sandia senior scientist Mike Campbell (1200) says, “This experiment showed that fusion will still occur if a plasma is heated by slow, rather than rapid, compression. With rapid compression, if you mix materials emitted from the tube’s restraining walls into the fuel, the fusion process won’t work; also, increased acceleration increases the growth of instabilities. A thicker can [tube] is less likely to be destroyed when contracted, which would dump unwanted material into the deuterium mix, and you also reduce instabilities, so you win twice.”

Says Matt more technically, “We demonstrated that the requirements for inertial confinement fusion can be dramatically reduced using insulating magnetic fields and laser pre-heating of the fuel. This allows us to substantially reduce the required implosion velocity of the target, which allows us to use targets that are more robust to instabilities. The magnetic field also reduces the fuel density requirement by several orders of magnitude.”

Besides the primary deuterium fusion neutron yields, the team’s measurements also found a smaller secondary deuterium-tritium neutron signal that was about a hundred-fold larger than what would have been expected without magnetization, providing a smoking gun for the existence of extreme magnetic fields.

The question had remained whether it was indeed the secondary magnetic field that caused the 100-fold increase in this additional neutron pulse, or some other, still unknown cause. Fortunately, the pulse has a distinct nuclear signature arising from the interaction of tritium nuclei as they slow down and react with the primary deuterium fuel. This interaction, carrying with it a fingerprint of the influence of the magnetic field on the fusion process, was detected by the sensors of Sandia researchers.

A path to ‘high gain’ fusion conditions

That is the subject of the theoretical paper “Understanding fuel magnetization and mix using secondary nuclear reactions in magneto-inertial fusion.” Using simulations, Paul Schmit (1684), Patrick Knapp (1688), et al confirmed the existence and effect of extreme magnetic fields via simulations. Their calculations showed that the tritium nuclei would be encouraged by these magnetic fields to move along tight helical paths. This confinement increased the probability of subsequently fusing with the main deuterium fuel.

Says Paul, “This dramatically increases the probability of fusion. That it happened validates a critical component of the MagLIF concept as a viable pathway forward for fusion. Our work has helped show that MagLIF experiments are already beginning to explore conditions that will be essential to achieving high yield and/or ignition in the future.”

The foundation of Sandia’s MagLIF work is based on work led by Steve. In a 2010 *Physics of Plasmas* article, Steve showed that a tube enclosing preheated deuterium and tritium, crushed by the large magnetic fields of the 25-million-ampere Z machine and a secondary magnetic field, would yield slightly more energy than is inserted into it.

A later simulation, published January 2012 in *Physical Review Letters* by Steve and Roger Vesey (1684), showed that a more powerful accelerator generating 60 million amperes or more could reach “high-gain” fusion conditions, where the fusion energy released greatly exceeds (by more than 1,000 times) the energy supplied to the fuel.

A paper led by Adam et al, published July 24 in *Physics of Plasmas*, further explicated and designed the experiments based on predictions made in Steve’s earlier paper.

But, says Mike Campbell, “There is still a long way to go.”



“HERE, A MIRACLE OCCURS!” — No, it’s just a series of equations and graphs describing Z, being batted about between Sandia’s Patrick Knapp (1688), left, and Paul Schmit (1684). (Photo by Randy Montoya)

Recharge, renew, restore: Discover the Energy Hub

High performance requires recovery

By Susie Kritter

Sandia's workforce is comprised of extraordinary achievers who perform at a high level. But working intensely may cause you to sit for long periods of time, foregoing those beneficial breaks to move, stretch, or clear your head. The Working Well Group, in support of Sandia's Strategic Objective 5 — "Commit to a learning, inclusive, and engaging environment for our people" — has created a dedicated space to help you get back to the basics of wellness at work.

A model Energy Hub opened this month in Bldg. 831, Rm. 193. The Hub is a dedicated space where you can take a short break to move, stretch, or practice a stress-reduction technique. The Hub also serves as a lactation station for nursing mothers. Specialized equipment and a clean, private space will personalize a break that will help you recharge, renew, and restore your mind and body.

An Energy Hub Panel Discussion was held Sept. 3 to talk about this initiative with key stakeholders. Topics included Strategic Objective 5, the research-based approach, and how the endeavor seeks to support a diverse workforce, promoting inclusion for everyone.

Center 5900 Director Ann Campbell explained that Strategic Objective 5 includes promoting a healthy, energized workforce through focus on the work environment. "The workforce makes us who we are," Ann said.

Center 300 Director Rob Nelson described the Working Well initiative's focus on healthy food options, creating opportunities for movement, and both indoor and outdoor spaces supporting wellness. Working Well's latest contribution to this systems approach is the creation of the Energy Hub, based on research showing the numerous benefits of breaks and movement throughout

the workday.

"There is a strong association between sitting and all causes of mortality," said Jon Pier (3334), an exercise physiologist at Sandia. Research demonstrates that even those who participate in regular exercise routines are not immune to the risks of prolonged sitting. Jon added that these issues can be mitigated by "interrupting sitting" with short breaks throughout the day, incorporating movement or stress-reduction techniques to:

- Recover posture
- Restore energy
- Improve focus
- Manage stress

From its inception, the Working Well Group sought to incorporate inclusion and diversity into Energy Hubs.

"We bring our full selves to work," said Esther Hernandez, senior manager for Diversity and Equal Employment. She explained that the Energy Hub provides tools for a diverse workforce, accommodating a broad range of personalities, multiple generations, and nursing mothers.

Members of the workforce are welcome to visit the model Energy Hub located in Bldg. 831. Experience the power of a break for yourself by briefly detaching from your workspace. Use the equipment dedicated to improve posture (carefully selected to ensure safety in use), practice a relaxation technique demonstrated in a touchscreen video, or create your own rejuvenating practices.

Safety was at the forefront of discussions during the creation phase of the Energy Hub initiative, according to Lisa Teves, a registered dietitian at Sandia. "We used a systems approach to create the Energy Hub, looking at risks and benefits," Lisa says.

Research and care were used in selecting equipment, providing instructional posters and video clips because this is an unsupervised space.

"Synergy created this space," says Bruce Fetzter, director of 3600, referring to the collaborative efforts of many groups (e.g., Preventive Health, Creative Services,

Diversity and Inclusion, Facilities, ES&H, Safety) to build the foundation, look, and feel.

Various groups around Sandia are working with HBE Preventive Health and Creative Services to create an indoor or outdoor Energy Hub in their work areas. Representatives from those groups are available for consultation if you are interested in creating a space to accommodate the needs of your division, center, group, or organization.

To learn more, visit workingwell.sandia.gov for comprehensive information on the program, how you can create an Energy Hub in your work area, the benefits of taking short breaks, current Working Well locations, and more. For your convenience, Energy Hubs are also featured on the HBE mobile App under the Health and Wellness tab.

An Energy Hub isn't just a place to go and take a break; it is a visible reminder that breaks are necessary to sustain high performance. The overarching message is this: Breaks are crucial for everyone. Whether you choose to take a short walk, purchase a Better Bite from a vending machine, or visit an Energy Hub, prioritize personal wellness, and remember, your personal energy stores are limited, but renewable.



SANDIA'S MODEL ENERGY HUB offers a dedicated space to take a short break to move, stretch, or practice a stress-reduction technique. The Hub also serves as a lactation station for nursing mothers. The aim of the Energy Hub is to help you recharge, renew, and restore your mind and body.



SANDIA EXERCISE PHYSIOLOGIST Jon Pier (3334) says research supports the idea that short breaks throughout the day can aid in recovering posture, restoring energy, improving focus, and managing stress.

Sen. Heinrich gets update on Sandia/UNM research collaborations



SEN. MARTIN HEINRICH (second from left) was briefed about collaborative Sandia-University of New Mexico research during an Aug. 28 visit to the Advanced Materials Laboratory. From left, Sandian Rick Kemp (1815), who also is a professor of chemistry at UNM, briefed Heinrich on energy efficiency and a renewable energy fracking study; Fernando Garzon (1815), who joined Sandia and UNM this month as the first Sandia-UNM joint hire, was introduced to Heinrich; and Sandia Fellow Jeff Brinker (1000), who also is a professor of chemical and biological engineering at UNM, briefed Heinrich on protocell technology. Rick and Jeff were Sandia employees at the time UNM hired them as professors, and Fernando is the first hired as a joint employee. He holds a PhD in materials science and engineering from the University of Pennsylvania. Sandia and UNM signed a memorandum of understanding in 2011 that identified areas for research collaboration and opened the door to joint hiring of nationally prominent faculty. Later in the afternoon, Sandia and Los Alamos National Laboratory researchers briefed Heinrich about several LDRD projects and the importance of the work to national security. (Photo by Randy Montoya)

Sandia's 17th Weapon Intern Program class graduates 22 students

Aug. 28 marked the 17th Weapon Intern Program (WIP) graduation, where 22 new graduates joined the ranks of WIP graduates from Sandia, the Air Force Nuclear Weapons Center, the Defense Threat Reduction Agency, Kansas City Plant, Los Alamos National Laboratory, National Nuclear Security Administration, Pantex, Savannah River Site, Air Force, and Y-12. WIP began in 1998, with recognition that Sandia's nuclear weapons mission responsibilities to ensure a safe, secure, and effective deterrent require the ongoing transfer of decades of nuclear weapons knowledge and experience to new generations. WIP helps expedite this knowledge transfer with a curriculum that evolves to better address the future challenges of maintaining the nation's nuclear deterrent. Graduates build and enhance strong relationships and interdependencies across multiple sites and organizations. In the photo here, WIP graduates at the Aug. 28 graduation ceremony are joined by senior mentors, WIP staff, and guest speakers Joseph Oder (middle row, center), executive director of the Air Force Nuclear Weapons Center on Kirtland Air Force Base, and Sandia Deputy Labs Director and Executive VP for National Security Programs Jerry McDowell (back row, third from right).



2015 Truman Fellow’s Sandia research aims to boost understanding of turbulent flow

Researcher Julia Ling has been selected as Sandia’s 2015 Truman Fellow. She joins the ranks of 20 other Fellows who have been appointed since the President Harry S. Truman Fellowship in National Security Science and Engineering was established in 2004. Because the fellowships are three-year assignments, four Truman Fellows are still doing research at Sandia as part of their fellowship. Additionally, 13 other Truman Fellows subsequently joined the Labs’ technical staff upon completion of their fellowship assignments, nine of whom are still researchers at Sandia.



JULIA LING

Julia, who earned her doctorate in mechanical engineering from Stanford University, will work in Thermal/Fluid Science and Engineering Dept. 8365 under the mentorship of Jeremy Templeton and manager Greg Wagner. She will begin her Fellowship at Sandia’s California site in October 2014.

“This year’s Truman Fellow candidates once again offered outstanding credentials — it was very difficult to select the top five individuals to interview,” says Sandia Chief Technology Officer and Div. 7000 VP Julia Phillips. “After careful deliberation by the Truman Committee, which is composed of senior scientists/engineers and a Sandia Fellow [see box below], we are excited to welcome Julia Ling to our Truman Fellow ranks. We look to Truman Fellows to become outstanding research leaders, setting directions that will broadly influence the

work of the Laboratories. “Sandia’s Truman Fellowship Program continues to attract excellent researchers who make significant contributions to the research community, either at Sandia when they become staff members or as our research partners at other top institutions. We hope that Julia will have a productive and enjoyable time at Sandia. We are delighted that she has chosen to be the latest in our great Truman Fellow tradition.”

Julia earned a bachelor’s degree in physics from Princeton University and a master’s in mechanical engineering from Stanford. Her doctoral dissertation at Stanford was titled “Improvements in Turbulent Mixing Modeling for Trailing Edge Slot Film Cooling Geometries: A Combined Experimental and Computational Approach.” In her dissertation work, she designed fundamental physical experiments to understand the effect of trailing edge geometry on cooling jet behavior. This is important since it is the biggest source of inefficiency in gas turbine engines. She developed a new way to compare computer experiments to physical experiments and used insights from those comparisons to significantly improve the state of the art in computational modeling of turbulence.

Julia has won numerous awards and scholarships, including three for physics or academic excellence, one physics fellowship, and six merit fellowships in graduate school, including a National Science Foundation fellowship. She has had varied research experiences, starting as early as high school, where she performed research in immunology. As an undergraduate at Princeton, she studied low frequency electromagnetic waves in plasmas under magnetic fields and worked on anti-reflective windows for space telescopes. She studied earthquake prediction at NASA Ames. As a graduate student, she spent a year in Australia studying thrust for a prototype spacecraft propulsion engine.

The Truman Fellowship selection committee found Julia’s research goals to be a good fit for Sandia. The committee wrote, “The study of engine efficiency is important to energy security. Computational fluid dynamics more generally has applications to reentry from space and vehicle movements through water or air. Julia’s work on validation of computational models with physical experiments and uncertainty quantification is a



President Harry S. Truman Fellowship in National Security Science and Engineering

good match to multiple areas at Sandia such as 8300’s combustion research facility, 1500, and 1400. Her particular combination of techniques is unique and complementary to current Sandia expertise.”

The *Lab News* recently asked Julia to describe the work she intends to pursue at Sandia. Here’s what she had to say:

“Richard Feynman called turbulence ‘the most important unsolved problem of classical physics.’ Turbulent flows are all around us, including ocean waves,



SANDIA’S NEWEST TRUMAN FELLOW, Julia Ling, engages in one of her favorite hobbies. At Sandia, Julia will probe the depths of turbulent flow.

air flow around cars, combustion in jet engines, and blood flow through the heart. The question of how to best model turbulent flows is one of the most long-standing and challenging problems in physics. A wide variety of computational fluid dynamics (CFD) models have been developed to enable simulations of these flows. However, there is no consensus on how to best assess the uncertainty and sensitivity of these simulations.

“My research will apply optimization techniques and machine-learning algorithms to fluids datasets with the goal of improving uncertainty analysis for CFD simulations. This research will use

machine learning algorithms to develop markers that flag regions where specific assumptions break down, enabling tighter uncertainty bounds and motivating model improvements. By elucidating when these simulations are predictive, this research would be invaluable in the design of gas turbine engines, internal combustion engines, and in other high-Reynolds number flows. Furthermore, this research will promote efforts to use machine learning toward scientific discovery.

“Sandia is an ideal setting to pursue this research because of its leadership in uncertainty quantification, fluids simulations, and machine learning. I would like to work at the intersection of those fields to build a capability for using big data sets to inform physical models. I plan on working closely with Jeremy Templeton and Greg Wagner in the Thermal/Fluid Science and Engineering department in the Livermore branch of Sandia. I hope to tap into the tremendous expertise at Sandia in uncertainty quantification to transform the way fluids simulation results are post-processed and understood.”

About Sandia’s Truman Fellowships

The Truman Fellowships are three-year appointments. Candidates are expected to have solved a major scientific or engineering problem in their thesis work or have provided a new approach or insight to a major problem, as evidenced by a recognized impact in their field. The program fosters creativity and stimulates exploration of forefront science and technology and high-risk, potentially high-value R&D. A panel of seven senior scientists/engineers and one Sandia Fellow reviews and ranks each application, interviews finalists, and makes a hiring recommendation to the CTO, 7000. Applications are now being taken for the 2016 application deadline of Nov. 1, 2014.

The 2014 panelists were: Cynthia Phillips (Chair, 1464), Joe Michael (1819), Philip Kegelmeyer (8900), Ed Cole (1000), Tan Thai (5600), Phil Dreike (5700), Michael Desjarlais (1600), and Paula Imbro (8600).

Sandia’s University Research Office (7911) and Human Resources (3554-3 and 3555) teamed more than nine years ago to create the Truman Fellowship Program and develop the processes necessary to implement the prestigious position.

Current Truman Fellows: Paul Schmit, Christina Ting, Grey Ballard, and John Gamble.

Evaluating powerful batteries for modular grid energy storage

By Stephanie Holinka

Sandia has begun lab-based characterization of Transpower’s GridSaver, the largest grid energy storage system analyzed at Sandia’s Energy Storage Test Pad in Albuquerque.

Project lead David Rosewater (6111) says Sandia will evaluate the 1 megawatt lithium-ion grid energy storage system for capacity, power, safety, and reliability. The Labs also will investigate the system’s frequency regulation, which grid operators need to manage the moment-to-moment differences between electrical supply and demand.

“Independent evaluations provide valuable feedback for industry efforts to standardize metrics for characterizing and reporting reliability, safety and performance. Companies need the standards to develop large procurement goals for grid energy storage because they must be able to compare performance and cost,” says David.

The data generated from characterizing a large system like GridSaver will improve operational models, identify technology or research gaps, and provide feedback to manufacturers to improve system performance, reliability, and safety. Additional specific tests will help validate Sandia’s grid energy storage characterization protocols, which have been developed jointly by industry and the national labs, as pre-standards to measure and express energy storage system performance.

“Industry needs these standards and they don’t yet have them. The protocol will give us critical information that can be used to compare flow battery systems, lead-acid battery systems, lithium-ion systems, and flywheel systems on an even field, apples to apples,” David says.

Utilities and other electricity and transmission providers and regulators often require that equipment be proved safe and reliable before it is permitted to operate on the electric grid. However, energy storage manufacturers and integrators are

often unable to afford or provide the logistics necessary for this long-term testing and monitoring.

A complex integration of components

Sandia’s Energy Storage Test Pad and Energy Storage Analysis Laboratory test facilities validate manufacturers’ specifications of energy storage devices through characterization and application-specific cycle testing. They can also help users evaluate system parameters, including storage device efficiency, performance to specifications, reliability, and balance of plant operation.

David says national, state, and local policies that push for a cleaner, more secure electric grid are driving significant increases in variable renewable generation, but that makes the job of operators much more difficult. Storage helps mitigate that variability, when it’s safe, reliable, sustainable, and cost-effective.

“Developing an energy storage system involves the complex integration of many components beyond just the battery, including sophisticated power electronics and controls — often communications. Sandia is assessing the entire system,” says Imre Gyuk, program manager in DOE’s Office of Electricity Delivery and Energy Reliability. The office has identified four challenges to the widespread deployment of energy storage: the cost of energy storage technologies (including manufacturing and grid integration), validated reliability and safety documentation, an equitable regulatory environment, and industry acceptance.

“Third-party evaluation of large systems like TransPower’s GridSaver can help break down the barriers to grid energy storage proliferation,” David says.

GridSaver was commissioned by the California Energy Commission’s Public Interest Energy Research (PIER) electric program.

Sandia’s work is funded by DOE’s Office of Electricity Delivery and Energy Reliability.

Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads Sandia Classified Ads

MISCELLANEOUS

SONY TV, SXRD KDS R60XBR1, w/Sony stand, DVD player, \$250 OBO. Hennessey, 505-269-6243.

TV, 60-in., works, \$200; drapes, 8'L x 51" ea., beige scallop design, \$30; milk glass hurricane lamp, w/rose, 16-in. high, \$35. Colgan, 344-3776.

PING PONG & FOOSBALL TABLES, sold as set, w/all accessories, good condition, free delivery, \$200. Baker, 890-1389.

GLASSWARE: 7 parfaits w/spoons, \$40; 12 icers w/cocktail forks, \$70. Wells, 292-0179.

SAMSUNG TV, series 6, 46-in., LED, 1080p, 240 CMR, WiFi, remote, user manual, \$575. Post, 280-4503.

ACOUSTIC BASS GUITAR, Ibanez, \$100; TV stand cube, 30; desk, \$25. Hart, 708-205-9449.

KITCHEN TABLE, round, solid oak, w/4 chairs, like new condition, \$200. Velasquez, 235-5861.

LEGO MINDSTORMS ROBOTICS INVENTION SYSTEM 2.0, never opened, 100% complete, \$100 OBO. Boruff, 505-917-2231.

ELLIPTICAL, NordicTrack w/iFit, rarely used, \$400; Hyundai Santa Fe wheel, no longer have vehicle, \$15. Richter, 309-657-1720.

ROCK CLIMBING SHOES, women's 7.5, Evolv Trax-XT5, worn once, w/book, bag, chalk bag, chalk, \$40. Schutzberger, 505-908-7587.

GOLF PUSH/PULL CART, BagBoy, 3-wheel, file cabinets, 2, oak, 2 drawers, locking, 20"W x 29"H x 28"D, modern design, \$50 ea.; Lane recliner, \$100. Allen, 856-7891.

LAB BOTTLE, Pyrex no. 1595, 5-gal., Brazil, \$150 OBO. Aragon, 892-3033.

SECTIONAL COUCH, dark brown, bonded leather, w/storage ottoman, photos available, delivery negotiable, \$500. Reeder, 553-4786.

MIRROR, 4-in. metal frame, 30" x 42", \$150; 2 lamps, w/shades, 34-in. tall, \$45 ea.; photos available. Pitts, 505-293-5481, ritapitts@comcast.net.

COMPUTER STAND, 47"L x 24"D x 30"H, w/moveable computer shelf (can be attached at varying heights), 12-in. quarter circle shelf, \$30. Miller, 697-7356, ask for Dennis.

GATE CONTROL, Mighty-Mule, \$250 OBO. Riley, 263-4345.

COFFEE TABLE, 2 end tables, solid oak, mission-style, \$95/all. Elmazi, 505-856-2197, ask for Thekla.

HOME THEATER SOUND SYSTEM, Panasonic, Blu-ray, 5:1 channel, model SC-BT203, \$100; 1928 RCA Radiola 60, \$50. Bobbe, 505-350-9544.

PIANO, 1960s Baldwin Acrosonic, finish in fair condition, \$250 OBO. Ward, 292-1618.

DINING ROOM TABLE, 3' x 5', wood, glass top, 6 chairs, \$200. Tappan, 505-506-7422.

'02 BALLOON FIESTA POSTER, blue mat, blue metal frame, 26" x 36", MSRP, \$235 unframed, asking \$150. Dockerty, 828-0745.

KITCHEN HUTCH, w/glass doors, \$55; wooden dresser, \$55; queen bed & frame, \$100; mirror, \$60; photos available. Allen, 505-850-3163.

TREADMILL, power incline, platform folds up, excellent condition, \$125 OBO; elliptical machine, excellent condition, \$100 OBO. Schriener, 275-3312.

FURNITURE, 2 couches w/recliners, \$700; coffee table, \$175; end tables, \$175; media center, \$300; queen sleigh bed, \$200; excellent condition. Atchison, 235-5651.

COMPUTER DESK, credenza, blonde veneer, photos available, you move, free. Inlow, 797-8375, gloria.inlow@comcast.net.

STACKABLE WASHER & DRYER, Frigidaire Gallery, front-loading, 15 yrs. old, in storage 4 yrs., good condition, free. Smith, 463-0911.

TRANSPORTATION

'06 HONDA CIVIC EX, 4-dr., 5-spd. manual, Galaxy Grey, 92.6K miles, new tires, 34-mpg hwy, \$8,600. Emery, 505-407-0830.

How to submit classified ads
DEADLINE: Friday noon before week of publication unless changed by holiday. Submit by one of these methods:
• EMAIL: Michelle Fleming (classads@sandia.gov)
• FAX: 844-0645
• MAIL: MS 1468 (Dept. 3651)
• INTERNAL WEB: On internal web homepage, click on News Center, then on Lab News link, and then on the very top of Lab News homepage "Submit a Classified Ad." If you have questions, call Michelle at 844-4902. Because of space constraints, ads will be printed on a first-come basis.

- Ad rules
1. Limit 18 words, including last name and home phone (If you include a web or e-mail address, it will count as two or three words, depending on length of the address.)
 2. Include organization and full name with the ad submission.
 3. Submit ad in writing. No phone-ins.
 4. Type or print ad legibly; use accepted abbreviations.
 5. One ad per issue.
 6. We will not run the same ad more than twice.
 7. No "for rent" ads except for employees on temporary assignment.
 8. No commercial ads.
 9. For active Sandia members of the workforce, retired Sandians, and DOE employees.
 10. Housing listed for sale is available without regard to race, creed, color, or national origin.
 11. Work Wanted ads limited to student-aged children of employees.
 12. We reserve the right not to publish any ad that may be considered offensive or in bad taste.

'98 SUBARU OUTBACK, 150K miles, runs well, AC needs work, 2nd owner, have all records, \$3,000. Garcia, 505-235-7859.

'10 NISSAN ROGUE, AWD, black, new tires, 44K miles, 27-mpg, very clean, excellent condition, \$10,900. Mack, 977-6229.

RECREATION

'06 MAXUM, 19-ft., open-bow boat, 88-hrs. on engine, excellent condition, \$15,500 OBO. Romero, 205-5147.

'07 FLEETWOOD POP-UP CAMPER, sleeps 6, king beds, heater, stove, hot water, awning, outdoor grill, \$5,885. McAllaster, 821-4687.

'12 HONDA CBR1000RR, pearl white, garage kept, 3.2K miles, \$11,000 OBO. Whitaker, 505-550-3706.

'01 EXCEL LIMITED EDITION 5TH WHEEL, 35-ft., 3 slide outs, \$17,000. Pollard-Walker, 505-865-4972, ask for Karen.

'13 ROAD KING CLASSIC, red/black, new tires, lots of chrome, many extras, 40K miles, runs well. Vigil, 220-6938.

'06 SHERCO 2.9 TRAILS MOTORCYCLE, photos here: http://tinyurl.com/psd5nok, excellent condition, \$3,200 OBO. Pryor, 505-340-6241.

'07 YAMAHA RAPTOR 700, many extras, loading ramps, helmet, skid plates, performance upgrades etc. \$2,750. Houchens, 702-677-0264.

'10 ITASCA REY 25R RV, only 2,704 miles, stored inside, many factory upgrades, \$86,000 OBO. Brown, 980-4320, scott.boydengineering@gmail.com.

'10 FUNFINDER X-139 TRAVEL TRAILER, 14-ft., sleeps 3, stove, microwave, dinette, wet bath, radio, TV, \$9,900. Nichols, 504-4570.

REAL ESTATE

5 ACRES, bordering northwest corner Belen Municipal Airport, city zoned commercial, \$39,900. Aragon, 888-3473.

4-BDR. HOME, 3 baths, 2,549-sq. ft., 1/4-acre, in hills in front of Garin Regional Park, Hayward CA, close to BART/bridges, MLS#40664709, \$885,000. Lumpkin, 510-409-7387.

3-BDR. TOWNHOUSE, 2 baths, 2-car garage, 1,611-sq. ft., NE Heights, courtyard gated, patio covered, private backyard, close to conveniences, \$222,000. Gianoulakis, 505-514-6441.

3-BDR. HOME, 2 baths, 1,685-sq. ft., walking distance, Volterra development, 1915busher.com, \$244,900. Parsons, 505-554-1601.

4-BDR. HOME, 3 baths, 4,280-sq. ft., wooded lot, pool, full walkout basement, 817 Lamp Post Circle, \$439,900. Ramos, 505-220-5201.

WANTED

EMPTY WINE BOTTLE, for craft booth display, will pick up, need it by Sept. 19. Chavez, 505-385-6442.

FEMALE YELLOW LAB PUPPY, between 6 & 8 wks. old. Drake-Kerr, 507-7253, evenings, ask for Gayle.

ROOMMATE, Los Lunas, 4-bdr. home, 30 mins. to KAFB, pets negotiable, \$350/mo., includes utilities & WiFi. Janssen, 925-819-2795.

FEMALE HOUSEMATE, share 3-bdr. home, 2 baths, Rio Rancho, near bus commute to Sandia, available immediately. Axness, 505-796-8776, ask for Laura.

PET/HOUSE SITTER, trips Nov./Feb./March, dogs/cats, insulin injections to dog, spend the nights, near KAFB. Tapia, 934-1792.

'81-'85 TOYOTA 4x4, used to own one, would love to own one again. Martin, 623-687-7673.

WORK WANTED

BABYSITTING, pet sitting, house sitting, from UNM student, negotiable rate. Twyeffort, 505-554-9287.

LOST AND FOUND

LOST: silver heart-shaped charm, w/diamond chips, lost Sept. 8, near 855. Harrer, 844-6052.

2015 Open Enrollment is coming soon!

- Active Open Enrollment runs Monday, Nov. 3, through Thursday, Nov. 20
- PreMedicare Open Enrollment runs Wednesday, Oct. 15, through Friday, Nov. 21
- Medicare Open Enrollment runs Wednesday, Oc. 15, through Saturday, Dec. 6

Fair information is as follows:

Sandia/New Mexico Active Open Enrollment Benefit Fairs				
Date	Tuesday, Nov. 4	Tuesday, Nov. 11	Saturday, Nov. 15	Monday, Nov. 17
Location	Steve Schiff Auditorium Building 825	IPOC — 2 nd floor break room and Thunderbird Conference Room	Sandia Laboratory Federal Credit Union at 3707 Juan Tabo Blvd	Steve Schiff Auditorium Building 825
Audience	Employees	Employees	Employees and Spouses	Employees
Fair Time	9 a.m.-2 p.m.	10 a.m.-2 p.m.	9 a.m.-2 p.m.	9 a.m.-2 p.m.

Sandia/California Open Enrollment Benefit Fairs			
Date	Thursday, Nov. 6	Thursday, Nov. 6	Thursday, Nov. 6
Location	904 Auditorium, 7011 East Avenue, Livermore, CA		
Audience	Employees and Spouses	PreMedicare Retirees	Medicare Retirees
Fair Time	12:15-2:30 p.m.	8:30 a.m.-noon	8:30 a.m.-noon
Presentation Time	N/A	10:15 a.m.-noon	9-10 a.m.
Presenters	N/A	Towers Watson/OneExchange, BCBSNM, Kaiser Permanente, UHC	Towers Watson/OneExchange, Kaiser Permanente

SNL-NM Retiree Open Enrollment Benefit Fairs				
Audience	PreMedicare Retirees	PreMedicare Retirees	Medicare Retirees	Medicare Retirees
Date	Tuesday, Oct. 28	Wednesday, Nov. 12	Tuesday, Oct. 28	Wednesday, Nov. 12
Location	UNM Continuing Education Building, 1634 University Blvd., Albuquerque, NM 87102			
Fair Time	9-11:30 a.m.	1-3:30 p.m.	1-3:30 p.m.	9-11:30 a.m.
Presentation Time	10-11 a.m.	2-3 p.m.	2-3 p.m.	10-11 a.m.
Presenters	Towers Watson/OneExchange, BCBSNM, UHC	Towers Watson/OneExchange, BCBSNM, UHC	Towers Watson/OneExchange, Lovelace, Presbyterian	Towers Watson/OneExchange, Lovelace, Presbyterian





Practice makes perfect

• Photos by Randy Montoya •

Operation Bridge Over Troubled Water, Sandia’s annual emergency exercise, took place Wednesday, Sept. 10, and brought together people from around the Labs to evaluate how Sandia Security and Emergency Management respond to a catastrophic event. The exercise began about 8:25 a.m. with a Labs-wide TARS announcement to shelter in place. Emergency responders were later paged to the Emergency Operations Center (EOC) where they learned a fictional tornado had touched down, moving south to north from Tech Area 5 to I-40, causing severe injuries to Sandia personnel and damage to buildings. Exercise response took place in locations including the EOC, Facilities Management Operations Center (FMOC), the Simulation Cell in Bldg. 822, the Communications office in IPOC, and a mobile command center in Tech Area 1. “This exercise was a success,” says emergency planner Sam Henderson (4236). “Participants, given the magnitude and severe circumstances, demonstrated a working knowledge of each other’s capabilities and an effective emergency response for protecting people, environment, and property for a very complex scenario.” The annual exercise is graded by the DOE to keep Sandia’s emergency responders at the top of their game.

